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Title: IMPROVEMENTS TO A CUTTING ATTACHMENT.

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 for suspending the cutting attachments allows the latter to be lifted. When the robotic lawn mower passes, the balls beneath the freely rotating disk are not touched by the blades. Friction is also reduced as compared to the fixed disk application, since the forward movement of the machine is coupled to the rotation of the disk in contact with the ball.

The other advantages provided by the presence of the disk as described in patent application no. PCT/BE96/00012 are maintained, particularly the self-cleaning and jam-preventing properties.

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 To this end, it shall be noted that the addition of peripheral prongs to a not freely rotating disk involves a specific undesirable obstruction before the disk. This obstruction is caused by the collection of grass blades of variable length by the prongs as the machine advances. Thanks to the free rotation proposed according to one of the variants of the invention, the forwardly directed prongs are directed backwards after a half-turn, and the friction with the lawn grass causes said grass to be released and the pronged disk to be cleaned.

This change to the disk as compared to prior art also increases cutting system safety. When in contact with a living being or an object to be protected, the modified disk will prevent or strongly reduce any direct contact with the blades. Therefore, the device according to the invention might also be advantageously used in non robotic cutting devices (bush-cutters, mowers).

Hence, this invention proposes a cutting

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attachment for a mowing machine, particularly for a lawn mower, comprising a motor whereof the driving shaft is linked to a cutter disk perpendicular to said shaft and provided at its periphery with at least one blade, and a bottom plate substantially parallel to, and located beneath the cutter disk, characterized in that the bottom plate periphery has substantially coplanar extensions or prongs, extending radially beyond the zone reachable by the blades.

The bottom plate or disk is substantially circular and has a diameter, excluding the extensions, which is substantially equal to or smaller than the one of the cutter disk. By way of example, in the case of a robotic lawn mower, the cutter disk may have a smaller diameter ("excluding the prongs") of 22 cm and an "outside" diameter of 29 cm.

The bottom plate is mounted freely on the cutter disk pin via a roller bearing, e.g. a ball bearing, or the like.

Extensions are provided in the form of prongs having a rounded profile (hollows and tips). The distance between two tips or ends of adjacent extensions 33 ranges, for instance, from 2 cm to 5 cm. The number of extensions per bottom plate preferably ranges from 10 to 60, more preferably from 20 to 40.

The cutting attachment is preferably linked to the chassis via a suspension system.

The cutting attachment will be preferably suitable for a robotic lawn mower, particularly for mowing golf courses, more particularly for mowing practice courses.

The invention will be understood more clearly

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from the following description, with reference to one embodiment, and particularly to the drawings annexed by way of non-limiting examples.

Fig. 1 is a bottom view of the plate of a cutting attachment according to the invention.

Fig. 2 is a sectional side view of a cutting attachment mounted on a member of the chassis.

Figs. 3a through 3c show the operation of the cutting attachment in the presence of a ball according to prior art (Fig. 3a) and according to the invention (Figs. 3b-c).

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 In Fig. 1 the bottom circular plate 3, freely rotating about the cutting axis 6, is recognizable. The cutter disk 2 is situated above the plate 3, and is driven by the motor, parallel to the plate. The cutter disk has three blades 1 at its periphery, which extend radially and can pivot freely about an axis of rotation 4 and retract thereafter beneath the cutter disk under the effect of an excessive resistance. (The bottom plate 3 (freely rotating protective disk) is provided with regular, coplanar extensions 33 at its periphery in the form of rounded prongs extending beyond the zone that the extracted blades can reach by the centrifugal force due to the rotation of the cutter disk.) The distance between two radial ends of the extensions is smaller than the size of the objects, in this case of golf balls. Balls are kept out of the reach of the free blades between two adjacent extensions. When the grass is cut balls are not touched by the blades.

As the robotic lawn mower advances, the cutter disk will pass over the balls, partly by free rotation

thereof, partly by friction.

According to a variant, which is currently less preferred, the ends of the extensions may be upwardly curved.

5 Fig. 2 shows more particularly a cutting attachment which is mounted in a well-known suspended arrangement (suspension rod 7, spring (17) ^{rod in drawing} on a member 8 of the chassis. The numeral 5 denotes the location of the ball bearing allowing free rotation of the protective plate 3, all other numerals being equally
10 provided in Fig. 1. It shall be noted that the extensions 33 of the plate 3 extend radially slightly beyond the extracted blades 1.

Figs. 3a-b show the contact between the cutting
15 attachment and a spherical object, e.g. a golf ball. In Fig. 3a, the cutting attachment is a prior art cutting attachment. As the lawn mower advances, the ball 9 is damaged in 10 by the rotating blades 1, before passing under the "floating" cutting attachment, totally in
20 friction, particularly under the freely rotating plate 3.

Figs. 3b and 3c show the contact between the cutting attachment of the invention and a golf ball. The extensions 33 of the plate 3 prevent the blades
25 from contacting the ball, which will advantageously pass beneath the freely rotating plate, while the cutting attachment is lifted. At the same time, the ball itself will generally sink to a certain extent into the grass, and will pass beneath the plate with a
30 minimized friction (Fig. 3c).

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